

## Energy and poverty

Fokion K. Vosniakos

*Balkan Environmental Association (B.EN.A. – International),  
Alexander Technological Educational Institution of Thessaloniki,  
P.O. Box 141, 57400, Thessaloniki, Greece*

### Abstract

Some 1.6 billion people – one – quarter of the world population – have no access to electricity. Over the next three decades, the investment needs for new power generation capacity in developing countries will amount to \$2.1 trillion. Even if this investment is secured, in the absence of vigorous new policies, 1.4 billion people will still lack electricity in 2030.

Four out of five people without electricity live in rural areas of the developing world, mainly South Asia and sub- Saharan Africa. But the pattern of electricity deprivation is set to change, because 95 % of the increase in population in the next three decades will occur in urban areas.

Some 2.4 billion people rely on traditional biomass- wood, agricultural residues and dung – for cooking and heating. That number will increase to 2.6 billion by 2030. In developing countries, biomass use will still represent over half of residential energy consumption by 2030.

Lack of electricity and heavy reliance on traditional biomass are hallmarks of poverty in developing countries.

In rural sub – Saharan Africa, many women carry 20 kilogrammes of fuel wood an average of five kilometers every day.

Poor people in the developing world are constantly exposed to indoor particulate and carbon monoxide concentrations many times higher than World Health Organization standards. The WHO estimates that 2.5 million women and young children in developing countries die prematurely each year from breathing the fumes from indoor biomass stoves.

Key words: Energy, Poverty, Global, Renewable, Nuclear, CO<sub>2</sub>-emissions.

### Introduction

The Earth's energy resources are undoubtedly adequate to meet rising demand for at least the next three decades. Governments and consumers are, nonetheless, likely to continue accepting a degree of risk in return for competitively priced energy supplies. Investment of almost \$4.2 trillion will be needed for new power generation capacity alone between now and 2030.

Energy- related emissions of carbon dioxide (CO<sub>2</sub>) are set to grow slightly faster than energy consumption. To extend electricity supplies to the energy poor and give them better access to other forms of modern energy policies and coordinated international action will be essential

More than a quarter of the world's population has no access to electricity and two-fifths still rely mainly on traditional biomass for their basic energy needs. Although the number of people without power supplied will fall in the coming decades, a projected 1.4 billion people will still be without electricity in 2030.

| GAS                           | Concentration (parts per million)   |       | Relative Effectiveness (per molecule) |
|-------------------------------|---|-------|---------------------------------------|
|                               | Pre – Industrial  | Now   |                                       |
| Carbon Dioxide                | 275   | 350   | 1                                     |
| Methane                       | 0.8   | 1.7   | 27                                    |
| CFCs                          | -   | 0.001 | 15.000-25.000                         |
| Nitrous Oxide                 | 0.28  | 0.31  | 165                                   |
| Ozone<br>(in the troposphere) | Meaningful values cannot be given to the ozone in the lower atmosphere because its concentration varies greatly from one region to another and its behavior is very complex |       |                                       |

**Figure 1. Effectiveness of Green house Gases**

## Materials and methods

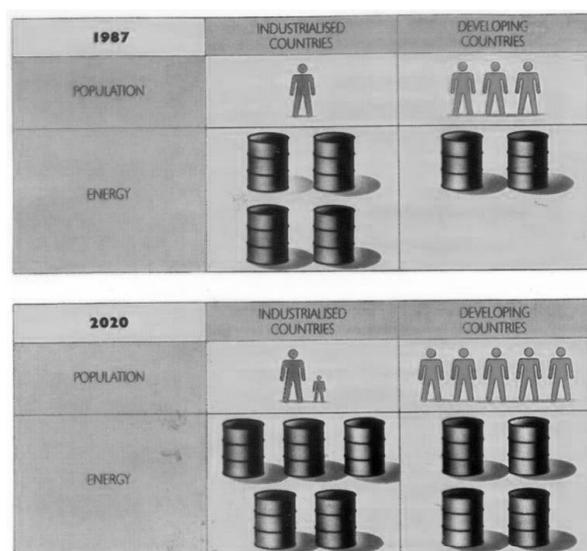
### Fossil Fuels Will Continue to Dominate Global Energy Use

World energy use will increase steadily through 2030. Global primary energy demand is projected to increase by 1.7 % per year from 2000 to 2030, reaching an annual level of 15.3 billion tones of oil equivalent.

Fossil fuels will remain the primary sources of energy, meeting more than 90 % of the increase in demand. Global oil demand will rise by about 1.6 % per year, from 75 mb/d in 2000 to 120 mb/d in 2030. Almost three- quarters of the increase in demand will come from the transport sector. Oil will remain the fuel of choice in road, sea and air transportation.

Demand for natural gas will rise more strongly than for any other fossil fuel. Primary gas consumption will double between now and 2030, and the share of gas in world energy demand will increase from 23 % to 28 %.

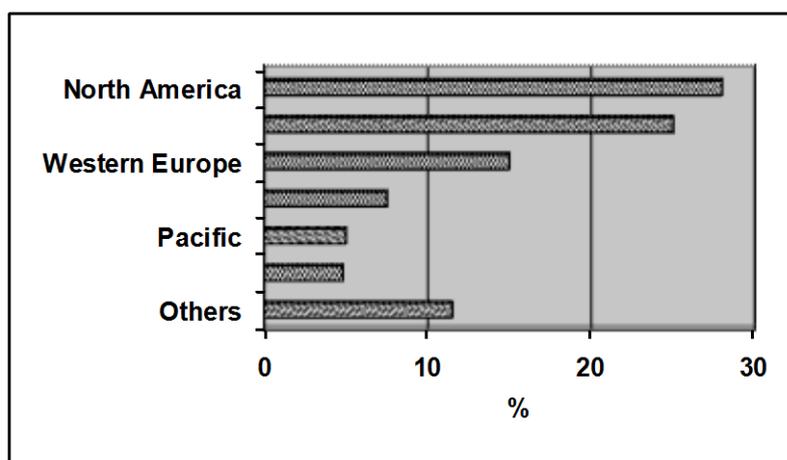
China and India together will account for two- thirds of the increase in world coal demand over the projection period.



**Figure 2. Growth in population and energy demand 1987 – 2020**

### Role of Nuclear Power

The role of nuclear power will decline markedly, because few new reactors will be built and some will be retired. Nuclear production will peak at the end of this decade, then decline gradually. Its share of world primary demand will hold steady at about 7 % through 2010, then fall to 5 % by 2030. Its share of total electricity generation will fall even faster, from 17% in 2000 to 9% in 2030. Nuclear output will increase in only a few countries, mostly in Asia. The biggest declines in nuclear production are expected to occur in North America and Europe.

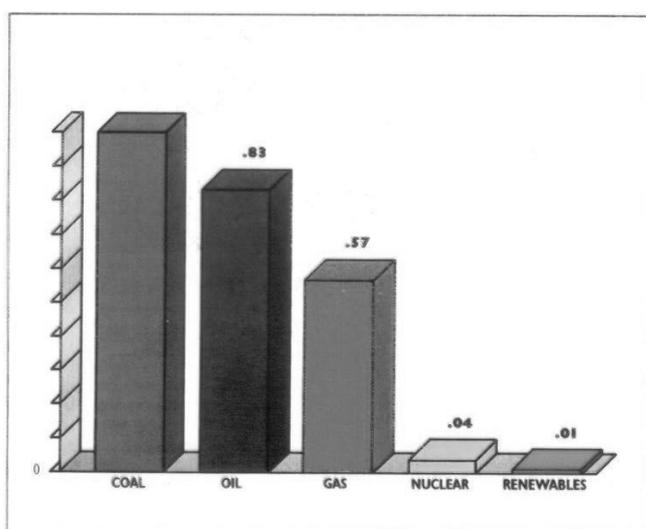


**Figure 3. Global CO<sub>2</sub> emissions by region**

### Renewables

Hydropower has long been a major source of electricity production. Its share in global primary energy will hold steady, but its share of electricity generation will fall.

Non - hydro renewables, taken as a group, will grow faster than any other primary energy source, at an average rate of 3.3 % per year over the projection period.



**Figure 4. Relative CO<sub>2</sub> emissions per unit of electricity**

### Demand Will Rise Fastest in Developing Countries

More than 60 % of the increase in world primary energy demand between 2000 and 2030 will come from developing countries, especially in Asia. These countries share of world demand will increase from 30 % to 43 %.

China, already the world's second- largest energy consumer, will continue to grow in importance on world energy markets as strong economic growth drives up demand and imports. The Chinese economy will remain exceptionally dependent on coal, but the shares of oil, natural gas and nuclear will grow in China's energy mix. Increasing oil- and gas import needs will make China a strategic buyer on world markets.

### Transport Uses Will Outstrip All Others

Transport demand, almost entirely for oil, will grow the most rapidly of all end- use sectors, at 2.1 % per annum. Transport demand will increase everywhere, but most rapidly in the developing countries. Consumption in the residential and services sectors will grow at an average annual rate of 1.7%, slightly faster than in industry, where it will rise by 1.5 % per year.

Electricity will grow faster than any end- use source of energy, by 2.4 % per year over the Outlook period. World electricity demand will double through 2030, while its share of total final energy consumption will rise from 18 % in 2000 to 22 % in 2030. The shares of oil and gas in world final consumption will also remain broadly unchanged. Oil products will account for roughly half of final energy use in 2030. The share of coal will drop from 9 % to 7 %.

### Fossil Energy Resources Are Ample, But Technologies and Supply Patterns Will Change

Reserves of natural gas and coal are particularly abundant, while there is no lack of uranium for nuclear power production. The physical potential for renewable energy production is also very large. But the geographical sources of incremental energy supplies will shift over the next three decades, in response to cost, geological and technical factors.

More oil will become available from Russia and the Caspian region, and this will have major implications for the diversity of supply sources for oil- importing countries.

Global crude oil refining capacity is projected to increase by an average 1.3 % a year, reaching 121 mb/d in 2030. Refineries will have to boost their yields of transportation fuels relative to heavier oil products, as well as improve product quality.

Fuel cells are also projected to make a modest contribution to global energy supply after 2020, mostly in small-decentralized power plants.

International energy trade, almost entirely in fossil fuels, will expand dramatically. In absolute terms, Europe will see the biggest increase in gas imports.

### Rising Demand Will Drive Up CO<sub>2</sub> Emissions

Global energy – related emissions of carbon dioxide will grow slightly more quickly than primary energy demand. They are projected to increase by 1.8 % per year from 2000 to 2030 reaching 38 billion tones in 2030. This is 16 billion tones, or 70 % more than today.

The developing countries share of global emissions will jump from 34 % now to 47 % in 2030, while the OECD's share will drop from 55 % to 43 %. China contribute a quarter of the increase in CO<sub>2</sub> emissions, or 3.6 billion tones, bringing its total emissions to 6.7 billion tones per year in 2030. Even then, main well below those the United States.

Emissions in those OECD countries that signed the Protocol will reach 12.5 billion tones in 2010, the middle of the Protocol's target period of 2008- 2012. That is 2.8 billion tones, or 29 %, above the target.

Under the Protocol, lower emissions in Russia, Ukraine and Eastern Europe, Known as "hot air", can be sold to countries with emissions over their target.

### Policies Under OECD Would Curb Energy Demand and Emissions

In OECD countries would reduce CO<sub>2</sub> emissions by 2.150 billion tones in 2030. This is roughly equal to total emissions of Germany, the United Kingdom, France and Italy today. The biggest reduction in CO<sub>2</sub> emissions would come from power- generation, because of the rapid growth of renewables and savings in electricity demand.

### Providing Modern Energy To The World's Poor Will Be An Unfinished Task.

Some 1.6 billion people have no access to electricity, according to data compiled specially for this study. More than 80 % of the people who currently lack electricity access live in South Asia and sub- Saharan Africa. The majority of them live on less than \$2 per day, but income is not the only determinant of electricity access. China, with 56 % of its people still "poor" by international definition, has managed to supply electricity to the vast majority of its population.

In the absence of major new government initiatives, 1.4 billion people, or 18 % of the world's population, will still lack electricity in 2030, despite more widespread prosperity and more advanced technology.

2.4 billion people in developing countries use only such fuels for cooking and heating. Over half of people relying heavily on biomass live in India and China, but the proportion of the population depending on biomass is heaviest in sub- Saharan Africa.

Over 2.6 billion in developing countries will continue to rely on biomass for cooking and heating in 2030. That is an increase of more than 240 million, or 9 %.

### What About Water?

Of all water on earth, only 2.5 per cent is freshwater, the rest is salty. Of this freshwater, most is frozen in icecaps, present as soil moisture, or inaccessible in deep underground aquifers, leaving less than 1 per cent accessible for use.

Despite progress in the last two decades to improve access to safe drinking water, some 1.1 billion people today go without. In the next two decades, total water demand is expected to increase by 440 per cent.

### **Conclusions**

- First, in the next 50 years, global population will grow from 6 billion to 9 billion. In a world where human misery is already vast and widespread, unmet human needs will multiply drastically.
- Second, between now and 2050, as countries seek to meet the needs of this exploding population, global energy consumption will double and possibly triple.
- Third, the global rate of CO<sub>2</sub> emissions – already 25 billion tones a year, or 800 tones a second – is still growing.

- Fourth, to stabilize green- house gases, even to that higher and possibly perilous level, requires that global emissions be cut by 50 %.
- Fifth, the Kyoto Protocol represents one small step toward global action on the environment.
  - Contraction means that over the century ahead we must plot a path that will reduce overall global emissions by at least 50 % - even as populations and economies expand.
  - Convergence means that, in this process, we must accept the principle that every person on Earth is entitled to an equal per- capita level of emissions.
- Sixth, nuclear energy today faces two barriers:
  - One barrier consists in the persistence of misinformation about the technology itself, questions – and folklore – relating- to safety, waste, proliferation and cost.
  - A second barrier is an incomplete appreciation, even at the highest level of government, of the full severity of the global problem that urgently demands the massive clean energy contribution that only nuclear power can make.

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